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Electrochemical Aptasensor Based on Poly(Neutral Red) and Carboxylated Pillar[5]arene for Sensitive Determination of Aflatoxin M1

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Abstract

© 2018 Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim Aptasensor for highly sensitive determination of aflatoxin M1 (AFM1) was developed on the base of glassy carbon electrode (GCE) covered with polymeric Neutral red (NR) dye obtained by electropolymerization in the presence of polycarboxylated pillar[5]arene derivative. Aptamer against AFM1 and NR label were then covalently linked to the carboxylic groups of the carrier by carbodiimide binding. At presence of AFM1 the cathodic peak current related to the NR conversion decreases. AFM1 induced also an increase of the charge transfer resistance measured by electrochemical impedance spectroscopy. In optimal conditions, this make it possible to determine from 5 to 120 ng/L AFM1 in standard solutions with limit of detection (LOD) of 0.5 ng/L. The aptasensor was validated on the spiked samples of cow and sheep milk as well as in kefir after their methanol dilution. Reliable detection of the 40–160 ng/kg of mycotoxins was reached. This is below limited threshold value (50 µg/kg) established in EC.

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Keywords

Aflatoxin M1, DNA aptamer, Electrochemical impedance spectroscopy, Electropolymerization, Neutral red

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